Smart Cities
Implementing Equitable Transit Initiatives
January 2018

Photo: Chowdhury, Shehab (2017)
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glossary</td>
<td>4</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>5</td>
</tr>
<tr>
<td>Introduction</td>
<td>9</td>
</tr>
<tr>
<td>Summary Recommendations</td>
<td></td>
</tr>
<tr>
<td>1. Centering Equity</td>
<td>12</td>
</tr>
<tr>
<td>2. Getting Buy-In</td>
<td>19</td>
</tr>
<tr>
<td>3. Building a Smart Cities Team</td>
<td>23</td>
</tr>
<tr>
<td>4. Financing Smart Cities Initiatives</td>
<td>27</td>
</tr>
<tr>
<td>5. Navigating Collaborative Governance</td>
<td>32</td>
</tr>
<tr>
<td>i. Models of Collaborative Governance</td>
<td>34</td>
</tr>
<tr>
<td>ii. Partners and Stakeholders in Collaboration</td>
<td>37</td>
</tr>
<tr>
<td>a. Private Sector</td>
<td>38</td>
</tr>
<tr>
<td>b. Advocacy Groups</td>
<td>39</td>
</tr>
<tr>
<td>c. Civic Hacker and Tech Community</td>
<td>41</td>
</tr>
<tr>
<td>d. Academia</td>
<td>43</td>
</tr>
<tr>
<td>Conclusion</td>
<td>45</td>
</tr>
<tr>
<td>The Team</td>
<td>47</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>47</td>
</tr>
<tr>
<td>Endnotes</td>
<td>49</td>
</tr>
</tbody>
</table>
Glossary

**Autonomous Vehicles (AVs):** Unmanned vehicles (cars, buses, or trucks), capable of independent driving without human intervention.

**Captive Users:** Public transportation riders for whom public transit is the only means of transportation, who do not have regular access to a car or other forms of transit.

**Choice Users:** Public transportation riders who have other means of transportation but choose to use public transit.

**Civic Hacking:** The use of technology to solve civic problems, often through utilizing accessible government data ("open data"). Civic hackers are usually volunteers organized through formal or informal networks or paid employees of a nonprofit organization.

**Electric Vehicles (EVs):** Vehicles that use electric power for propulsion.

**Equity:** Fair access to services, resources, and opportunities, given equally to all communities within a municipality.

**Internet of Things (IoT):** A system of interconnected objects (usually sensors, mechanical devices, or everyday appliances rather than computers) that can transmit and receive data over the Internet.

**Public-Private Partnerships (PPPs):** A type of arrangement between a public agency (such as a local government) and a private company to fund, build, or operate a project or a service.

**Smart Cities:** A broad term referring to the use of new technology, particularly information and communication technologies (ICT), to enhance the provision of public services in a municipality. In the context of transportation, a Smart City project can be anything from an application that provides real-time transit information to an array of sensors deployed to collect transportation-related data.

**Transportation Network Companies (TNCs):** Companies such as Lyft and Uber that use an online platform to connect passengers with drivers to enable real-time ridesharing.
Executive Summary

This report provides observations, analysis and recommendations about the design and implementation of Smart City policies in the field of transportation, for small to mid-sized U.S. cities, within three-to-seven year time frame. Our research, advised by Sokwoo Rhee, Associate Director of the Cyber-Physical Systems Program at the U.S. Department of Commerce’s National Institute of Standards and Technology (NIST), included field research in Miami, New Orleans, Portland, and Seattle, as well as meetings with practitioners and thought leaders in NYC and Washington D.C.. We set out to document shareable, “smart” practices, focusing on policy innovation rather than technology, with a particular emphasis on the needs of low-income and traditionally marginalized communities. We are a group of ten Masters in Public Affairs students from the Woodrow Wilson School of Public and International Affairs at Princeton University.
1. Center Equity Throughout all Phases of Smart City Implementation:

Design for Whom? Clearly Defining Your Audience Is the First Step to Design with and for Communities: Cities frequently grapple with decisions about for whom to design their projects. When it comes to new technologies, the role of cities is often to proactively regulate, ensuring that the advancements do no harm. Cities should serve marginalized communities where the private sector does not, and use technologies to disrupt current ineffective structures and redress inequities. Chapter 1: Equity discusses this recommendation further.

Systematically Engage Communities through Design, Pilot, and Rollout: Cities have a broader spectrum of real-world solutions to choose from as a result of developing Smart Cities technologies to tackle immediate and long-term inequities in transportation, ranging from rideshare apps to different transportation data platforms. To effectively design transportation systems that address and alleviate inequities, cities must use smart technology to better engage and center underrepresented communities and avoid structural biases. This can be done through ensuring that open feedback channels are developed with communities, especially marginalized ones, to develop more real-time information flows between city officials and residents. See Chapter 1: Equity for more information on this recommendation.

Collect and Analyze Information: In all the cities we visited, we found a significant lack of qualitative and quantitative data on the needs of both marginalized and disadvantaged communities. It is imperative for cities to proactively collect data, given that participation often appears to be a privilege rather than a right. Smart Cities initiatives have rarely engaged marginalized and targeted communities to date. Cities need to collect and analyze data to make sure systems are designed around the needs of marginalized communities. It should be an urgent priority to remedy this, as we recommend in more detail in Chapter 1: Equity.
2. Use Innovation To Boost Public Confidence in Government:

When building support among city agencies and elected officials, highlight the ability of strategic Smart City investments to help them solve local issues and improve their ability to help their city’s residents. Ultimately, this helps them do a better job, as it improves their standing with residents. Chapter 2: Getting Executive and Legislative Buy-In elaborates on this recommendation.

3. Build and Institutionalize a Political and Technical Team:

An effective team can coordinate across city agencies and across levels of government. While funding constraints are usually a serious issue, the best results in the cities surveyed were obtained by having a dedicated team focused on Smart Cities projects. Significant disruptions and coordination problems can arise when Smart Cities teams are more informal or ad-hoc. Ideally, government officials will have, develop, or acquire both the policy and technological expertise needed to address the challenges of creating policy and designing systems in a nascent and highly technical industry. Chapter 3: Building a Smart Cities Team elaborates on this recommendation.

4. Consider Tradeoffs Between Stability and Discretion when Seeking Finance:

We believe most cities will not need to raise substantial capital for dedicated smart transportation projects within the next three to seven years. However, we see a need for targeted discretionary funds. In many cities, most tax income and other revenues are dedicated to be spent for specific legally defined purposes, making it hard to find funding for innovative entrepreneurial initiatives. Hence, limited discretionary spending, free from excessive procurement controls, could have a greater impact on municipal innovation than huge, untouchable infrastructure packages. This is why grants [such as the Smart City Challenge from the U.S. Department of Transportation (U.S. DOT)] are tremendously valuable and should be expanded to more cities, as Chapter 4: Finance explains further.

5. Utilize In-House Staff and Leadership When Outsourcing Services:

In practice, governments undertake collaborative governance in a variety of ways, including contracts, public-private partnerships, and other agreements. However, regardless of the exact model, it is critical that government retain certain roles and capacity related to the services though the services are delivered by an outside entity. Outreach and strategic planning should be government-led, even when services are outsourced in collaborative governance arrangements. Technological expertise, subject matter expertise, and sufficient capacity are
all critical for strong formation and oversight of such arrangements. This is particularly critical for outsourcing related to Smart Cities technologies. Governments need to advocate for equity and mission alignment; to be the frontline listening to, educating, and interfacing with the public; and to be the long-term constant and guiding force as partners shift over the years. See the Models for Collaborative Governance section of Chapter 5 for further discussion of this recommendation.

6. Prioritize Mission Alignment When Collaborating with the Private Sector:

Many companies such as Uber and Lyft will want to partner with cities for public relations opportunities or to advance their own corporate interests. Cities must consider the long-term impacts on their bottom lines and ultimately on their end users. Private sector collaboration needs to be based on mission alignment such that cities and private sector entities can benefit from each other without becoming worse off for themselves. Pro bono services and resources may be very helpful; however, nothing is free for both public and private sector actors. The section on the private sector in Chapter 5: Collaborative Governance and Other Collaboration delves into this recommendation in more detail.

7. Link Transit Issues with Other Salient Topics when Advocating:

The most successful advocacy and nonprofit organizations are those that are able to link transit issues with jobs, healthcare, and other issues. Advocacy organizations create the pressure needed to build accountability mechanisms within city governments, while private sector organizations and civic hacker groups contribute technology expertise and skills to design solutions. Advocacy groups must be seen as partners, not adversaries, in Smart Cities implementation. These stakeholders, acting together, can provide the external impetus needed to drive the agenda and foster equitable innovation and change. Collaboration begins when stakeholders understand what each brings to the table and how sharing comparative advantages can lead to a consistently communicating ecosystem to serve the public—the ultimate user. The section on advocacy groups in Chapter 5 provides more information on this recommendation.

8. Use Academic Institutions as Hosts for Data Repositories:

Private sector stakeholders such as ridesharing companies, and in some cases even public agencies, may be reluctant to share their transportation data with cities and the public. Universities can play an important role as trusted hosts to help facilitate the cooperation of all relevant parties and can lend their technological expertise to clean and analyze the data. When designing such collaborations, however, cities should establish clear governance rules for ownership of the data. See the section on academia in Chapter 5: Collaborative Governance and Other Collaboration for further discussion of this recommendation.
Introduction

Smart transportation: New technologies and “smart” approaches, such as on-demand ridesharing, internet of things (IoT) sensors, and autonomous vehicles, are transforming urban transportation in the near future. These technologies can potentially be used to develop and catalyze improvements in transit services. Cities across the United States face significant challenges in upgrading, maintaining, and improving their transportation systems, including: designing with and for communities who are marginalized; addressing privacy and equity issues around data governance; working with nontraditional partners such as Uber and Waze; developing and setting up a Smart Cities team within city governments; partnering with nonprofits and civic tech organizations to make things better for the public; and modernizing procurement processes to handle new challenges.

“Smart City” solutions are often seen as designing and integrating new information flows to create living, breathing, responsive cities. Currently, U.S.
cities and their infrastructure are not often set up with real-time
capabilities for feedback loops, live transit data repositories, and
new relationship dynamics between cities and their residents. Smart
Cities technologies offer the potential to revitalize municipalities and
enable them to react, in real time, to their residents’ needs. This
vision is far from reality, however, as American cities are still working
to create the basic infrastructure for unleashing the potential of
Smart Cities improvements.

In fact, the physical infrastructure of most American cities is in
dire need of investment. The American Society for Civil Engineers’
overall grading of America’s infrastructure is D+; congestion
clogs movement, mobility, and productivity for sprawling metro
areas. Mass transit has the potential to relieve such congestion. But in many American urban areas, it is almost nonexistent, or it is
undermined by poor maintenance and antiquated facilities that
leads to delays and closure. Those who suffer most from these
ailing systems are captive riders, who cannot afford other means of
transportation besides public transit.

Public transportation is one of the chief issues policymakers
must address, both to keep their cities viable and to attract talent
to jumpstart economic development. Yet, there is a significant
gap between the purported vision of many cities and the real-life experiences of people who rely on transportation to access
jobs, healthcare, education and more. In the cities we visited the
user experience of public transportation was often characterized
as frustrated and hopeless concerning the reliability of public
transportation services. To create high-impact Smart City solutions,
urban governments must clearly identify users, build stakeholder
buy-in, find funds to finance initiatives, and develop mechanisms
for governance and collaboration (across all public and private
stakeholders).

About this Report

The report is structured to reflect the process of carrying out a
Smart City project in a municipality. We discuss equity first, as
one of our key recommendations is that equity must be considered
throughout all phases of program design and implementation. We then address the following: securing buy-in from decision
makers; building a dedicated Smart City team; financing projects;
and collaborating with partners outside of government, such as
the private sector, advocacy organizations, civic tech groups,
and academia. In each section, we describe observations, key
considerations, and recommendations. It is important to note that
we discuss a limited number of examples within our observations.
This does not mean that we did not observe other examples across
the four cities; thanks to the individuals we consulted, our meetings
included a variety of discussions that informed this report, though
necessarily not every example could be included.

Smart Cities solutions can result in a powerful reimagination of urban
transportation when designed to serve its users. Based on our field
work, it appears that the four cities visited, Miami, New Orleans,
Portland, and Seattle, are not as far along the path to implementing
Smart Cities solutions as may be advertised. The cities seemed to be
at a very preliminary stage of still designing or just considering pilot
projects and often had not yet identified long-term funding models
for full implementation and deployment of Smart Cities solutions.

To get to that powerful reimagination, cities must equitably address
the challenges of obtaining sustained buy-in, prioritizing foundational
investments in infrastructure, and joining with a wide range of
stakeholders to build Smart Cities that empower and uplift all city
residents. We hope this paper provides helpful considerations and examples of real policy solutions for policymakers to utilize in their work toward providing seamless mobility for all residents.

Preliminary Definitions

In this report, we discuss **Smart Cities** as ubiquitous and connected technologies, data, and communication solutions that have the goal of improving municipal management, governance, long-range planning, and residents’ quality of life. The term “Smart City,” however, has a fluid, wide-ranging definition. Some of the earliest “smart” infrastructure could be ventilation systems in the 1850s or traffic lights in the same period\(^5\). Today, cities around the country and the world are incorporating “smart” systems, changing the way people interact with their urban built environment. The scope and scale of these enhancements has progressed dramatically, encompassing entire districts or cities like Songdo, Korea, with sensors embedded in basic infrastructure. Data plays a key role in Smart Cities ecosystems; the harnessing and use of data is critical for Smart Cities to be able to make iterative real-time adjustments. This paper focuses on Smart City improvements in the United States in the realm of transportation, with a specific emphasis on equity. We were requested to focus on solutions within the United States but acknowledge that many international cities are leaders in this field.

In this report, **Equity** refers to access to opportunity, which involves fairness within systemic structures in society. Equity also encompasses the fairness with which the impacts (both benefits and costs) of programs are distributed\(^6\). Considering equitable deployment or sharing of resources is crucial in understanding public transportation in the United States. For most of urban America’s history, public transportation has been built in ways that either avoided or disproportionately made access difficult for certain targeted populations, such as African American communities within urban areas. Frequently, public transit is the only form of transportation for residents of marginalized populations, like the elderly. These repercussions have long-lasting impacts. Miami and New Orleans, for instance, are characterized by urban sprawl and historic neighborhood segregation, which lead to particularly long transportation commutes for communities of color, often resulting in commutes that are 1-2 hours longer than those of other groups\(^7\).
As cities grow, the allocation of resources and space within them often exacerbates inequity. The investments and policies cities make today for smart transportation solutions have great potential to bridge the divide among the most advantaged and disadvantaged populations. However, many cities have limited capacity to consider, define, and deploy such solutions equitably. Furthermore, few cities have mechanisms in place to engage disadvantaged communities in the meaningful design and deployment of smart transportation solutions. If cities do not address these concerns today, they risk turning smart transportation solutions into tools that further entrench and widen gaps in access and opportunity.

To ensure smart transportation leads to greater equity, we commend that cities:

1. Clearly define the target audience of Smart City solutions;
2. Determine the desired role of Smart city investments in promoting equity;
3. Use technology to listen to and design for underrepresented voices;
4. Build capacity to ensure equity is an ongoing process, not a checked-box.
Transportation is intrinsically tied to inequity. Inequitable access to transportation is not only a vestige of the past but an ongoing, systemic feature of many American cities. Our research and findings engage with the realities of a growing digital divide, persistent transportation deserts, and the increasing cost of transportation for low income communities—particularly as poverty becomes suburbanized. Roughly three-in-ten adults with household incomes below $30,000 a year do not own a smartphone. Only 25% of jobs in low and middle-skill industries are accessible via transit within 90 minutes for the typical metropolitan commuter, compared to one third of jobs in high-skill industries. Lower-income households spend nearly 16 percent of their income on transportation, while those at the top spend 8 percent. To bridge these divides, effective discourse and action on smart transportation must be rooted in these realities.

Cities risk deepening inequality by ignoring equity in Smart City investments. For most cities, the equitable delivery of transportation services is a major challenge. Overlaying or reverse-engineering equitable approaches on already-deployed transportation systems and services can be daunting, especially to cities with low capacity and small budgets. However, if cities proactively begin to build equity goals into their Smart City strategies upfront, they can better ensure equitable deployment going forward. Today, some cities are proactively and explicitly defining which populations should be at the center of their Smart City investments. Our analysis finds that the smart transportation strategies most effective in achieving equity goals are clear about which populations are the target audience for their smart transportation solutions and why.

Whom should cities design for? Different departments within a city may define underserved communities differently—for example, a transportation department may identify non-car owners as an underserved population to design for, while a digital equity team

Definitions

**Marginalized Communities**
Communities left out because of poor initial design, underfunding, e.g. individuals with disabilities, elderly communities, children

**Targeted Communities**
Communities intentionally left out of design decisions; those who the transit system never intended to serve, e.g. low-income and/or communities of color in transportation deserts

**Late Adopters**
Communities left out because of barriers in adopting technology, or because they are often the last populations to adopt new technologies, e.g. low-income communities without access to smartphones, electric vehicles.
may identify non-cell phone owners as underserved. However, this delineation does not capture residents who lack cars or devices due to choice versus circumstance. Furthermore, it does not delineate between residents who have been left out of the system by initial design choices because they were initially overlooked and residents who have been intentionally excluded from a transportation system to begin with. On page 13, there is a heuristic we developed to better differentiate between underserved communities by whether they are unintentionally or deliberately excluded from the design of transportation systems. (Note: These categories are not mutually exclusive.)

Understanding how transit inequity impacts various communities differently is essential in order to directly address each community’s specialized problems and pursue tailored solutions rather than one-size-fit-all policies. It is also important to note that any given community is not itself a monolithic group. For example, residents with different forms of disabilities (e.g., wheelchair users, people with hearing disabilities, or people who are visually impaired) often face different barriers with regard to transportation accessibility.

Observations

Some cities are centering targeted and marginalized communities in their Smart City investments. Cities such as Portland and Seattle have government-wide racial equity toolkits that project managers can use to review the implications and impacts of their projects on equity and social justice. The City of Portland is working to apply such toolkits to its Smart Cities work. In particular, Portland established an Equity Work Group as it builds a government-wide apparatus for coordinating Smart City investments and projects. The group will develop a framework to help prioritize investments and guide vendors and will be used to implement projects. At its inaugural meeting, discussions delineated between residents who lack technology by choice (e.g., residents who can afford but choose not to own a cell phone) versus by circumstance (e.g., residents who cannot afford a cell phone). They are working on a framework that focuses investments on targeted communities.

Similarly, a Portland initiative aimed at bridging the digital divide in excluded communities explicitly delineates between targeted and marginalized residents when formulating its action plan. Portland acknowledges that the needs and solutions faced by each community can be vastly different and specialized. The team hosted five focus groups to inform its recommendations and strategies. Three of these groups were organized around linguistic identity (Spanish-, Vietnamese-, and Chinese-speaking residents), one around race (an African American group), and one around residents with hearing disabilities.

Portland’s careful consideration of the different targeted and marginalized communities they want to center in their strategies could serve as a potential model for cities launching Smart Cities initiatives. Clearly defining these communities upfront allows cities to design around the different and specialized needs of each community. By defining these communities early on, cities can better use Smart City investments to bridge inequities instead of running the risk of perpetuating them.

Some cities are designing for late versus early adopters. Cities and private sector stakeholders outlined two different approaches to designing Smart City solutions. The traditional technologist approach is to design technology around early adopters. When designing around early adopters, however, organizations inevitably design around a select group of individuals who are not representative of the general population. As a result, uptake among the general population. As a result, uptake among the general population.

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population unfolds at a slower rate, with fewer individuals adopting the technology overall.

Alternatively, the more cities help spur design around those who are last to adopt, the more transferable and generalizable the technology is to the general public. For example, Portland is deploying its EV charging station policies around low-income and targeted communities—typically “late adopters.” The city, in collaboration with the state, recognized that low-income individuals tend to own higher-emission vehicles, bear a disproportionate burden of transportation time, and shoulder a higher percentage of gasoline and repair costs as a proportion of income. Thus, Portland plans to roll out EV charging stations where low-income residents live, in concert with state subsidies for EVs. This strategy not only works to alleviate the transportation burden faced by low-income communities, but also offers greater environmental gains than a traditional, early-adopter approach. This framework of designing around late adopters can serve as a powerful tool in deploying equitable smart transportation investments.

Some private stakeholders we spoke with stipulated that a late-adopter approach may make it harder to pay for innovative solutions, or that it may be disadvantageous to overburden innovation early on with requirements. Some technologies, they argued, need space to get going, and it may be more appropriate to consider equity in the deployment phase. But as cities consider how best to direct public money into Smart City investments, a late-adopter model may help cities better serve communities that are often omitted from private sector design considerations.

Smart City technologists and policy makers lack the data or feedback necessary to design around community needs. We encountered few examples of cities actively seeking and incorporating feedback into their Smart Cities strategies—although many strategies are still in their inception phase. In most instances, the local governments lacked quantitative or qualitative data on the transportation needs and potential ridership of marginalized communities. This lack of data or feedback reaches outside city hall; some civic tech groups, which aim to be community-empowered, more agile, and more responsive than city government, have little to no community involvement in the design of their agendas or prioritization of the projects their volunteers will pursue.

We saw some promising examples of community engagement in our field research. For example, a civic tech group in Seattle began to open its meetings up to community advocates to better pair problems facing marginalized and targeted communities with solutions. While these invitations are still passed on through word of mouth, the group is exploring ways to better institutionalize and publicize this process. Additionally, focus groups with marginalized and targeted communities formed the backbone of Portland’s digital equity strategy; hosting these groups allowed the city to develop specialized strategies around each group’s needs. Portland is also undertaking a mobility needs assessment to better understand the transportation needs of traditionally underserved communities and how smart transportation solutions can better address those needs.

As cities begin to think about utilizing data generated by smart technologies to inform planning and operational decisions, they must balance the ease of collecting such real-time data with the lack of representation of those excluded from participation. Inclusive approaches to soliciting and incorporating needs and feedback will lower the barriers to participation and make community engagement an active part of the Smart City solution deployment cycle rather than a checked box.
Key Considerations

Do no harm. While some of the real-world smart transportation projects we observed helped targeted communities, they were still implemented within systems that perpetuate structural inequities. Typical actions taken under initiatives designed “generally” for residents can actually cause more harm than good when designing for and with the needs of a particular community. We observed examples where stakeholders implementing smart transportation solutions proactively adopted a “do no harm” mentality. For example, a Portland shared mobility nonprofit made the decision not to call police to report a stolen bike from its electric bike initiative. They did not want their users, many of whom were low-income black youth, to be targeted by the police as a result of the report.

As cities roll out solutions to help targeted communities, they must contextualize their initiatives and collaborate with communities to understand their unique needs. Designing for all citizens means also designing for the heterogeneity of citizens. Programs must ensure that designing for the “average user” or “average citizen” does not normalize certain populations and marginalize others, exacerbating inequality.

Low-tech first. Low-tech solutions can dramatically improve public transportation for marginalized communities. Foundational improvements to current transportation can mean more reliable and efficient transportation. For example, a transportation advocacy organization in New Orleans advocates for improved reliability, a goal that requires low-tech solutions. New Orleans Regional Transit Authority (RTA) does not have GPS tracking technology on buses or trolleys. As a result, reliability and predictability is incredibly elusive for New Orleans riders dependent on public transit to reach jobs, school, and family.

Prioritizing low-tech solutions is imperative for improving basic services for riders dependent on public transportation. The push for GPS and an app-based real-time tracking platform would not only significantly improve the experience and outcomes for riders, but would also generate efficiency gains and enable increased route frequency. GPS tracking on buses, tracking apps, and signage to inform riders of estimated departure times are low-tech solutions that can greatly improve the experience and reliability of bus systems for riders.

Participation is currently a privilege. Town hall meetings still serve as a main source of collecting feedback from the community. However, attendees may not reflect the most pressing needs, but rather the most vocal or those with the time and resources to be present. Some cities use Twitter or 311 applications to collect feedback, but such mechanisms clearly suffer from selection bias. These forms of selection bias can be insidious: those who are able to access such technologies are not representative of populations most in need. Portland is beginning to use machine learning algorithms to process and analyze electronic and written public comments, enabling residents who do not have the resources to show up at city hall to be heard.

Smart technologies can inadvertently exacerbate these selection biases—but can also be used to correct them. For example, the advent of the smart card for public transportation brings a temptation to measure ridership through taps. However, not all riders use smart cards; those that do not tend to be lower-income. To correct for this bias, researchers at the University of Washington partnered with a local regional transportation authority to use data generated from pressure plates on buses to better triangulate ridership and trip patterns of non-smart card users.
Another consideration is identifying and removing barriers to participation. A partner of Portland’s digital equity team offered digital training pop-up classes alongside a workforce training organization in an effort to increase digital literacy in underserved areas. Initial attendance was low, but by engaging the community they found that a key barrier to participation was childcare. They subsequently offered childcare during training sessions and experienced much higher attendance, with the vast majority of their participants being women below the poverty line.

Considering equity in private sector collaboration. Several municipalities across the U.S. are partnering with TNCs such as Uber or Lyft to address the lack of access to public transportation among targeted communities. Some of these partnerships involve the use of taxpayer dollars to subsidize fares. As cities consider such partnerships, they must advocate for the needs of marginalized and targeted communities to ensure equitable access.

For example, a regional transit authority in Seattle is currently partnering with a TNC to provide first-/last-mile service. It has three conditions for the partnership and its use of taxpayer dollars:

1. Availability of wheelchair-accessible vehicles and driver training;
2. Ability for users without smartphones to order rides; and
3. Ability to implement subsidized fare structure already offered to low-income and other marginalized residents on current service.

Recommendations

1. Clearly define target audience:

When the audience is clearly defined, solutions are better equipped to achieve intended purposes. We encourage city government to define equity within its local context and determine the audience as preliminary steps. A potential framework includes designing for marginalized, targeted, and late adopter communities.

2. Determine level of investment in promoting equity:

Smart Cities investments and regulations have different potential “levels” of impact on marginalized and targeted communities.

Minimize Risk. At a minimum, cities and stakeholders must consider the possible implications of their Smart Cities investments in further perpetuating inequities. Such investments include projects aimed at the “general population” that have gone through a racial equity toolkit review to minimize harm. Cities may also consider regulating disruptive technologies to prevent bias and racism.
Correct disinvestments and incentivize serving the underserved. At the next level, cities can center their future Smart City investments around targeted and marginalized populations. City officials should consider how such investments can be used to correct for historic disinvestments in transportation. Cities may also consider how to incentivize the private sector to fill gaps in service provision, as most private sector companies in this space will design around early adopters rather than late adopters.

Disrupt current inequitable structures. The team did not see many examples of cities or advocates thinking about the potential of these technologies to disrupt current structures. However, cities should consider ways to leverage technology to enable economic mobility among targeted communities or to use technologies to empower targeted populations to make decisions about the policies and issues affecting their communities.

3. Use technology to listen to underrepresented voices:

Equity is easy to mention in a vision statement. To follow through, cities must actively listen to and design with communities in need. As cities begin to think about utilizing data generated by smart technologies to inform planning and operational decisions, they must balance the seemingly benign ease of collecting such real-time data with the lack of representation of those excluded from participation. Cities should consider how to leverage technology and innovative data analysis solutions to counter selection bias. Cities must also recognize where technology can exclude voices. Inclusive approaches to soliciting and incorporating needs and feedback will lower the barriers to participation and make community engagement an active part of the Smart City solution deployment cycle.

4. Build capacity to ensure equity is ongoing process:

Equitable smart transit will require deliberate effort. We found that cities making progress toward inclusive smart transportation had designated positions and offices thinking about the issue. Once feedback and data is collected, the city must have the capacity and power to act. Furthermore, cities are dynamic, and many are undergoing tremendous change. As cities grow and evolve, government needs to continually listen to feedback, assess and reassess needs, and ensure projects are having their desired equitable impact—and change course if they are not. Equity is an ongoing, collaborative process.
Securing buy-in is a vital step for innovative transportation projects—as is sustaining that buy-in over time and through changes in executive and legislative leadership. To create and sustain this political will, it is important to communicate with elected officials and other decision-makers in a way that helps them understand the value of these projects. Having an advocate in the local executive or legislative branch of government is crucial.

Our key recommendations for securing buy-in from decision makers include:

1. Use innovation to boost confidence in government;
2. Pitch the benefit of a more informed government;
3. De-risk projects where possible;
4. Tailor strategy to particular contexts;
5. Maintain a flow of newsworthy, “sizzle” projects; and
6. Sell both process and outcome wins.
Observations

Our discussions with political officials across all four cities highlighted a key concern: smart transportation technologies are inherently nascent, and therefore these projects carry some risk. This risk includes: reputational risk to elected officials who sponsor programs; fiscal risk through the use of taxpayer funds to implement them; and the privacy risk of possibly exposing sensitive data. Furthermore, innovation takes time. It may take years to move from the pilot phase to the point where tangible constituent benefits are realized. Given the relatively short tenure of elected officials, the politicians who propose and begin Smart Cities projects may no longer be in office when the fruits of their efforts are realized. This can diminish support from officials who are concerned with creating tangible benefits during their tenure.

Nonetheless, officials at many cities we spoke with, including those in Seattle and New Orleans, lead well-established innovation teams who excel at building political support for their work. Furthermore, many cities (including Seattle and Portland) have dedicated Smart City officials experienced in building buy-in. There is no such thing as a riskless smart transportation project, but these projects also carry significant potential benefits for both constituents and elected officials. Framing the realities and benefits of these projects correctly is an essential step for building and maintaining support from elected officials who control the resources required for implementation.

Officials who work on innovation teams and Smart Cities projects had a number of strategies for building and maintaining support. One official from Seattle highlighted that the process of innovation itself can often create a positive story worth sharing: bringing together marginalized stakeholders for the first time, creating new collaborative relationships with civic society or private companies, or providing meaningful work for local students and businesses. For elected officials concerned about not receiving credit for long-term projects or wary of the likelihood of success, these process outcomes can make them more willing to undertake new projects as they stand to gain support from new constituencies by reaching out to them.

In addition, members of the smart transportation team in Portland highlighted the value of the information generated by Smart Cities projects to generate buy-in from elected officials. The smart transportation team emphasized the potential to improve policymaking by facilitating data analysis. For example, sensors that collect pedestrian data can lead to a more efficient allocation of government resources for road and sidewalk services. These benefits can make legislators’ jobs easier on a daily basis and pay for themselves through more efficient allocation of services. Another, perhaps more mundane advantage is simply saving municipal employees time. Opening government data through a dedicated portal, for example, can help reduce the number of Freedom of Information Law (FOIL) requests—and thus cut down the hours staffers have to spend compiling answers.

Another official in Seattle highlighted the benefits of having a mix of both short-term projects and long-term projects to maintain support over time. For example, maintaining support for a team focused on the transition to AVs (which may take years to materialize) could be dependent upon its participation in other, more short-term Smart Cities wins that create positive momentum. An example of this is a collaboration between Microsoft and Seattle that applied pressure sensors to watering hoses, which allowed the Parks Department to identify watering system breakages and prevent wasteful leakages. The team also had longer-term projects but was able to create positive momentum with this short-term win.
Key Considerations

One solution does not fit all. Governments vary in size and organization. Knowing the correct political actor to engage can sometimes be a challenge in itself. For example, in New Orleans, the Regional Transportation Authority (RTA) is responsible for operating the buses, while the City Council is responsible for setting the fare. Investment in smart technology for buses would therefore require a coordinated effort across levels and entities of government.

Cities have different governance structures. Strategies for getting buy-in must also be tailored to the type of government in a particular locality. For example, some cities have strong centralized mayors, like New York City; others have more distributed forms of government, like Portland, which is governed by five commissioners. More centralized cities benefit from a strategy that elevates the public image of the central figure, while cities with more distributed power benefit from a strategy that focuses on how Smart Cities projects can improve their ability to legislate and govern as a whole.

Different cities face differing levels of resource constraints. Resource constraints are another hurdle that makes political officials less tolerant of the costs of smart transportation innovation. Mayors facing immediate and significant budget constraints may feel that they cannot invest in riskier projects with longer-term benefits because the city has other pressing concerns. Innovation is still possible in these cities. By adopting projects with a proven record of success in other cities, smaller cities can reap the benefits of smart transportation technologies without incurring the costs of earlier-stage innovation.

Recommendations

1. Use innovative approaches to boost confidence in government.

Innovation can boost governmental effectiveness, which carries political advantages. Furthermore, politicians who successfully launch new smart transportation projects can gain recognition both locally and nationally. Advocates for smart transportation projects should pitch these potential reputational benefits to elected officials, thereby encouraging innovative new solutions to residents’ problems as a way to build buy-in with constituents.

2. Pitch the benefit of a more informed government.

Elected officials and other government leaders must make difficult decisions on a regular basis. Too often they lack sufficient data to support their positions or inform their decisions. Smart transportation technologies can fill important informational gaps and, in turn, lead to more effective policymaking. This information will allow the elected officials, and the government as a whole, to have a better understanding of where to allocate resources for maximum positive impact for residents.
3. De-risk projects where possible.
While many smart transportation projects require government action, some can be carried out in coordination with partners who assume some of the risk. In fact, many partners are willing to assume some risk for the sake of innovation. Where possible, governments should look to collaborate with academic institutions, civic tech organizations, and the private sector to share the risk of innovation. (See Chapter 5 for a more detailed discussion of such collaborations.)

4. Tailor strategy to particular contexts:
When coming up with the strategy to build buy-in from elected officials in a given city, be sure to understand the local context—in particular, the city’s organizational structure, governance type, and level of resources. Pitch the smart transportation technology as a practical solution to a relevant issue.

5. Maintain a flow of newsworthy projects:
Short-term wins can build positive support to justify longer-term and more complex projects. Having a combination of both fosters trust in the value of the team, maintains the team’s relevancy to elected officials, and keeps the team engaged in solving local issues.

6. Sell both process and outcome wins.
When a project does achieve its intended benefit, elected officials should be encouraged to publicize those wins. However, when a project does not achieve its originally intended outcome, there can still be significant value from the process. Elected officials should be encouraged to leverage the benefits of the process, even when the outcome of the project was not exactly as expected. These projects give elected officials an opportunity to bring new constituents into the political fold, which can be an important tool for building support.
Institutionalizing a Smart Cities team is another essential step toward creating an environment in which smart transportation projects thrive. An effective team must be able to coordinate across city agencies and across levels of government. While funding constraints are a serious issue, it is beneficial (when possible) to have a dedicated team focused on Smart Cities due to disruptions and coordination problems that can arise when teams are more informal or ad-hoc. Ideally, Smart Cities government officials will have both policy and technological expertise to meet the challenges of building buy-in and working in a nascent and highly technical field.

Our key recommendations to creating dedicated Smart Cities teams are:

1. Institutionalize strategically, based on the city’s resources.
2. When possible, use tax-based funding.
3. Create a formal outreach strategy.
Observations

The cities we visited had very different structures for their teams, highlighting that there may be no one-size-fits-all approach. Portland had the most institutionalized Smart Cities team we visited. Housed within the Portland Bureau of Planning and Sustainability (BPS), the team includes full-time staff members dedicated to promoting Smart Cities activities within the city. This level of institutionalization allows for a more holistic and coherent approach than other more distributed or ad-hoc models. However, the institutionalization of the Portland team is a relatively recent phenomenon. The team’s institutionalization was a result of Portland’s proposal to the U.S. DOT Smart City Challenge. Despite not winning the grand prize, the city realized the benefits of having a team dedicated to implementing components of the proposal. That team has since been developing a Smart Cities strategy, project priorities, and a formal outreach plan, all of which are essential for future project success. In addition to dedicated Smart Cities staff, the structure includes a steering committee with representatives from the offices of elected officials and other agencies as well as a formal process for engaging the community to ensure buy-in.

In addition to the level of institutionalization, cities vary on where they house their Smart Cities team. Regardless of where the team is housed organizationally, coordination of initiatives is key. The Portland team sits within the BPS and benefits from a focus on cross-cutting issues. For example, issues of land use planning and sustainability typically require collaboration across agencies. This is also essential for Smart Cities projects, which similarly have many stakeholders. In contrast to Portland, in the summer of 2017, Seattle hired a Smart Cities coordinator to manage relevant projects that were emerging organically across the city. Projects had been initiated by the Seattle Department of Transportation, the Fire Department, and the Public Utilities Department. This central structure, while still more siloed than the Portland model, ensures accountability, alignment of projects on ICT and data standards, and coherence of vision. New Orleans also created a cross-cutting Office of Performance and Accountability that seeks to improve the operations and outcomes of city agencies through the application and analysis of data.

Funding the Smart Cities team was also a recurring issue in the cities we visited. Portland and Seattle both use taxpayer dollars to fund their dedicated Smart Cities officials, which provides greater stability than other forms of funding. In Portland, previous teams were assembled as needed to respond to various grant competitions. Because many of these competitions have a low likelihood of success, grant funding is considerably less reliable than full-time, taxpayer-funded Smart Cities positions. In addition to funding the team, a reliable source of funds is also needed for projects. In Seattle, a cable service fee directly funds an Open Data program, providing clear long-term resources and allowing the team to focus on execution without disruption.

Finally, the Smart Cities employees we met had a broad range of credentials and prior experiences. Seattle’s Smart Cities coordinator had previously worked on Smart Cities projects while on the innovation team of Kansas City. In addition to having worked on other Smart Cities projects, her experience navigating the politics of innovation is invaluable to maintaining support. Portland’s Smart Cities team includes a PhD environmental engineer. Her technical expertise is important to the ultimate success of selected projects. As the lead for a project to deploy air quality sensors, this official had the skills to evaluate different technological options, which was essential for ensuring that the city’s technological procurement would provide the expected quality of results. The need for both subject matter expertise and political tact was also raised in New Orleans, where the Emergency Medical Services (EMS) team...
instituted two co-directors after Hurricane Katrina: an EMS chief and a medical director. The medical director of EMS serves as the medical director across all public safety services, including police and fire. This broad purview and technical expertise allows for coordination and consistency across the city and facilitates the implementation of smart improvements at EMS, such as updates to its dispatchment system.

Key Considerations

Where the team sits matters. Some cities may prefer to house the Smart Cities team within an agency, while others may prefer to house the team within City Hall. While there may be no perfect location, it is important that the team sits in a position that will enable the type of cross-agency collaboration required of Smart Cities projects. Success requires credibility and the power to convene stakeholders. One government official highlighted that its Department of Information Technology did not have a reputation for innovation and would therefore not be a wise choice as the location for a Smart Cities team. Cities may also want to base the location decision on where different resources will be available to the team. For example, some departments may have better trust from the public, allowing for better public engagement. Similarly, transportation departments may have greater control over important assets such as traffic signals and rights of way. While these assets can be essential to a project’s success, access can also be achieved through strong collaborative relationships. For that reason, the primary concern should remain where to best locate the team to facilitate collaboration.

Teams should be aware of unrepresented voices, areas, and needs. While Smart Cities teams should strive to include diverse skill sets and perspectives, as well as representation of different governmental interests, ultimately not every stakeholder will be a part of the team. That said, Smart Cities teams should be aware and considerate of who is not represented. In some instances, this could prevent a project from ever getting started: in cities where transportation modes are distributed across levels of government, smart systems can be contingent upon each of the transportation modes coming together. For example, in Miami-Dade County, trolley systems are run by individual cities, and a city that chooses not to track its locations prevents smart trip planning at the county level. Another group that is often omitted until late phases of a project are the end users. Smart Cities teams should consider their plan for community outreach to ensure that they are designing solutions that are beneficial to end users. A team that seeks out the voices of those not included on the team will have a greater chance for success.

Resource constraints affect team structure. The consensus among interviewees in Portland and Seattle was that securing independent, long-term funding for Smart City teams is best accomplished through dedicated taxpayer funding. Though dependent on political will and affected by budget cycles, teams with budget funding secured are likely to be more stable over the long term, ensuring the continued presence of a voice at the table concerned with longer-term innovation and planning. Tying the Smart City team’s budget to one-off projects (such as the adoption of a particular system or a bid for a grant) diminishes the team’s impact and perceived influence and decreases the chances of creating a prolonged, sustainable Smart Cities directive. Not all cities will have the resources to staff a permanent and dedicated Smart Cities team of trained technical experts. Cities with fewer resources should ideally seek candidates with a balance of technical and political skills. Project management skills are essential for projects that replicate successes from other cities.
Recommendations

1. Institutionalize strategically:
   While resource constraints are a thorny issue, cities that are serious about implementing Smart Cities initiatives need to institutionalize a dedicated team. Having disparate agencies working in silos, or ad-hoc teams chasing new revenue streams, can create confusion and frustration. Not all teams will be staffed equally; however, all structures should include a coherent Smart Cities vision so that actors working on Smart Cities projects and technologies are pursuing the same outcomes. Regardless of team size, the Smart Cities team or individual official should be strategically located within the city government to boost the team’s reputation and ability to convene stakeholders. This includes having a direct channel of communication with city leadership to raise issues and maintain political support.

2. When possible, use tax-based funding:
   Though it may be politically or economically unattainable for some cities, directly funding staffers through the city’s budget improves the team’s long-term stability. Other forms of funding, such as grants and public-private partnerships, can lead to unstable funding, conflicts of interest, uncertainty, and significant time dedicated to finding resources.

3. Create a formal outreach strategy:
   Smart Cities teams should formalize an outreach strategy to ensure buy-in. Having a formal outreach process and regular check-ins can ensure that projects are designed to address constituent needs and political concerns, with all of the resources required for success. An effective outreach strategy should also ensure that the Smart Cities team has a say in the decision-making of other departments on issues that could affect current or future Smart Cities projects. Portland’s Smart Cities team steering committee structure can serve as a model for convening power. The Smart Cities team needs to have ongoing continuous engagement of decision makers to facilitate political will and constituent outreach. This is crucial to developing buy-in within local government and to develop the resiliency and trust of Smart Cities initiatives.
There are many potential financial tools available to fund Smart City projects. Cities use different funding sources, sometimes even within the scope of a single project. Though funding is naturally key for any venture, most near-term smart transportation projects that cities are working on will not require raising substantial capital. High-capacity cities should work to create discretionary budgets available to their Smart City teams, while more resource-constrained cities might benefit more from structured spending tied to specific projects.

Our key recommendations in this domain are:

1. Well-resourced cities should create dedicated spending sources for their Smart City teams to use at their discretion to fund nontraditional, innovative projects through shorter spending cycles;

2. Resource-constrained cities must protect innovation capital and seek opportunities to join innovation networks to learn from field leaders’ efforts rather than pursuing field-leading innovation independently; and

3. Grant-givers should consider long-term effects and build prize structures that ensure sustained buy-in from all cities.
Observations

Nationally, public transit funding is derived from a variety of sources. The funding sources for national transit expenditures in 2014 were as follows: passenger fares (23%); local assistance (23%); state assistance (22%); federal assistance (18%); other (14%). As would be expected, the composition of revenue sources varies by location. Portland gets the bulk of its transportation funding from state payroll tax revenues, while Seattle, Miami-Dade County, and New Orleans all rely heavily upon revenues from local sales taxes.

Passenger fares. Fare collection is an integral part of any public transportation system. Fares can be collected through tolls, member fees, and similar pay-to-use mechanisms. Virtually all municipalities rely on fare collection to at least partially fund public transit.

Taxes. Portland and Seattle both recently approved large-scale transportation funding initiatives. In July 2017, Oregon’s legislature approved a comprehensive transportation bill that would provide $5.3 billion in funding for transportation over 10 years through raising gas taxes and car registration fees. The bill also imposes a new payroll tax. 50% of the raised funds will be distributed to counties and cities. As a result, Portland specifically will receive about $150,000,000 over the next 10 years to fund local road maintenance and improvements.

In Seattle’s case, two major tax-based funding initiatives were recently approved. Sound Transit 3 will raise over $27.7 billion in property and sales taxes over 25 years to fund rail expansion throughout King County; and the Levy to Move Seattle will raise $940 million in property taxes over nine years to fund ongoing maintenance and new safety and traffic management programs.

In Miami-Dade County, voters approved in 2002 a half-penny sales tax dedicated to public transit as part of an initiative called “The People’s Transportation Plan” (PTP). Since 2002, the tax has generated approximately $2.8 billion; but as discussed further below, it has not catalyzed the dramatic mass transit expansion originally envisioned. In fact, over the last 15 years, only a fraction of the initial goals laid out have been met. A number of problems have contributed to this, from early funding mismanagement (which ultimately blocked anticipated potential federal funding) to imprecise language in the law that allowed the county to draw on PTP funding for operations and maintenance rather than for transit expansion capital expenditures.

Meanwhile, New Orleans has had a one-cent sales tax dedicated to public transit since 1985. While its Regional Transportation Authority (RTA) has seen some increases in sales tax collections over the last couple of years, the sales tax revenue in 2013 was $17 million lower than the revenue in 2004, demonstrating the volatility of the RTA's largest funding source.

Competitive grants and prizes. Though unlikely to contribute significantly to a city’s overall transportation budget, grants that prioritize innovation play a key role in driving technologically advanced projects. As mentioned above, the U.S. DOT launched a Smart City Challenge in 2015, inviting mid-sized cities to submit plans for a smart transportation project; the winning city would be awarded $50 million. While none of the four cities studied for this report won the challenge, all four participated, and Portland was one of the seven finalists.

The DOT’s Challenge, as well as earlier participation in NIST’s Global City Team Challenge, was a catalyzing force for Portland’s Smart City ecosystem. Collaborative networks of both public and private sector actors, created to support the city’s bid (such as Technology Association of Oregon’s Smart City Lab), still fulfill active consulting...
roles. Despite not winning the award, the submitted plan serves as a blueprint for the city’s independent planning and development efforts.

Other funding sources. As discussed in more detail in the next chapter, the private sector at times plays a key role in building and operating transportation systems across all four cities. Cities should be more creative about how to tap resources from private sector organizations who benefit from smart cities initiatives. Financing structures such as Tax Increment financing are further mechanisms cities should leverage this mechanism to create value for private sector leverage into actual dollars spent on smart cities initiatives. In some cases, the private sector can also serve as a source of funding for transportation projects—when a business interest driving the contribution exists. Examples include privately funded technological projects [e.g., the University of Washington’s Transportation Data Collaborative (UW TDC) in Seattle, backed by Microsoft], or the voluntary provision of services or subsidies to disadvantaged populations (e.g., Uber’s offer to provide subsidized first- and last-mile connectivity to public transportation in Seattle). Motivations can range from public relations concerns to technological or research and development interests to efforts to preemptively prevent regulation.

Another source of private sector funding can come from terms dictated to companies by regulators or by courts following a trial. One example is Volkswagen’s settlement with the Environmental Protection Agency following its emission-concealing scandal. As part of the settlement, Volkswagen committed to installing electric vehicle charging stations in 15 target cities in the U.S., including Portland.

Key Considerations

Most smart transportation projects in the near future will not require substantial dedicated capital. U.S. cities are in the early stages of adopting and implementing innovative transit technology; currently, the incremental cost of smart systems to the overall budget is relatively small. Smart City projects in the field tend to be focused on preliminary efforts: setting up dedicated innovation teams, gathering transportation data, creating shared repositories, and partnering with the private sector (rideshare companies in particular) to facilitate low-cost service delivery. Hardware costs for such projects tend to be limited, and most funds go towards wages, software, and some sensor installation.

While transportation projects tend to be costly and comprise a major part of municipal infrastructure expenditure, the “smart” component within them is often relatively minor. For example, Seattle’s $28 billion light rail initiative includes a total of $75 million over two decades for an “innovation fund” that will finance transportation data collection and research. At least in the near future, it seems likely that most cities will be able to fund smart transportation initiatives without a dramatic budget increase.

Discretionary funding is key, but it has drawbacks. Large, hotly-debated spending bills are often subject to strict public scrutiny, and may contain allocation mechanisms that ensure funds are only spent on their stated goals. As one interviewee put it, five million dollars in discretionary spending might contribute more to municipal innovation than a billion-dollar infrastructure bill carrying tight spending limitations and subject to stringent political review. Smart City teams require a dedicated budget to fund pilots, early projects, and research efforts. Cities that have the resources to fund such teams and allow them sufficient budget to experiment,
such as Portland and Seattle, will likely be field leaders in smart transportation and early to reap the rewards of connected, innovative transit systems. However, in resource-constrained cities, discretion can more easily lead to misallocation due to the multiplicity of urgent needs. Miami-Dade County’s PTP, described earlier, serves as a cautionary tale. Agencies that struggle to raise funds to support their day-to-day operations might be forced to dip into capital funds meant for investment and innovation. If more limitations had been in place and observed for the sales tax revenue fund, it may have ensured that taxpayer dollars were allocated as planned to needed long-term investment and not directed away to plug operational budget holes.

Grant givers should balance prize value and participation. Competitive grants such as the DOT’s Smart City Challenge can play an instrumental role in creating funding sources for innovative transportation sources. The relatively large sum of $50 million sparked interest and drew 78 cities to participate. The Challenge had a galvanizing effect even on some cities that did not win, such as Portland—a city that has the resources to independently pursue a smart transportation agenda based on the blueprint it created for the challenge.

Other cities, however, do not have the means or the supportive political environment that would allow them to execute a plan prepared for a competitive grant without grant funds. High-capacity cities such as Portland or Seattle may be able to pursue the plans they have developed on their own; cities with fewer resources are less likely to be able to do so. Moreover, if other grants replicate the U.S. DOT Challenge’s winner-takes-all structure, it is possible that interest will wane as cities grow reluctant to invest the resources needed to compose a bid and participate. A different prize structure (for example, one that would award lower funds to more participants) might help to maintain the appeal of future challenges.

Recommendations

1. Find dedicated spending sources:

Well-resourced cities should create dedicated spending sources for their Smart City teams to use at their discretion to fund nontraditional, innovative projects through shorter spending cycles. These funds can be used to pilot projects and direct independent research. Field leaders in smart transportation must allow their innovation team leads the budgetary autonomy to experiment, collect data, and encourage innovation. Since the financial scope of near-future projects will likely be modest, most municipalities should be able to accommodate Smart City teams within their budgets—the challenge lies in creating the necessary flexibility to support entrepreneurial ventures.

2. Learn from field leaders when financially infeasible to innovate independently:

Resource-constrained cities must protect innovation capital and seek opportunities to join innovation networks to learn from field leaders’ efforts rather than pursuing field-leading innovation independently. Municipalities that struggle to raise fares might have an incentive to dip into funds meant for investment in infrastructure—including technology. Cities facing this reality must create limitations on future spending.
to ensure innovation funds will not be misallocated. Additionally, joining consortia may allow them to benefit from the innovative efforts of higher-resourced municipalities instead of trying to reinvent the wheel on their own.

3. Grant-givers should consider long-term effects:

Not all cities will be able to independently pursue a plan formulated as part of a bid for a grant; and interest in prizes is likely to drop off if winning chances are very slim. To ensure competitive grants like the U.S. DOT’s Smart City Challenge maintain their impact over time and create value for resource-constrained cities as well, grant-givers should consider switching (or at least alternating) their prize structure from winner-takes-all and a large pot to smaller awards given to several cities.
Navigating Collaborative Governance
Chapter Overview

In Collaborative Governance: Private Roles for Public Goals in Turbulent Times, John Donahue and Richard Zeckhauser define collaborative governance as “the pursuit of authoritatively chosen public goals by means that include engaging the efforts of, and sharing discretion with, producers outside government.” Producers outside government include entities such as private sector companies, service-providing nonprofits, civic tech organizations, and academia.

Collaborative governance is especially relevant for cities aiming to undertake the equitable implementation of smart technology. First, city governments need non-governmental partners in smart tech in order to overcome critical skills gaps and bolster the success of smart tech endeavors. These partners may also add productivity advantages like economies of scale, access to talent, and market information.

Secondly, publicly-purposed smart tech needs government leadership. Once a collaborative governance arrangement is underway, it can be tempting for city governments to dial down their human capital investment and instead allow the partner free rein. However, without a strong presence from government, a number of issues may misdirect or undermine the smart tech project. Governments need to advocate for equity and mission alignment; to listen to, educate, and interface with the public; and to be the long-term constant and guiding force as partners shift over the years.

This chapter contains two parts that examine two important dimensions of collaborative governance: the type of model and the type of partner.

Section i. Models for Collaborative Governance:

In the first section, Models for Collaborative Governance, we find that it is critical that government invest in its own smart technology oversight capacity and policy leadership in order to keep the partnership mission-focused, including a focus on equity.

Section ii. Partners and Stakeholders in Collaborative Governance:

In the second section, Partners and Stakeholders in Collaborative Governance, we find there is much to learn from a variety of non-governmental partners in the smart technology space and that government has a unique role to play in fostering connections and communication among an ecosystem of actors.
i. Models of Collaborative Governance

In practice, governments undertake collaborative governance in a variety of ways. Collaborative governance models range from the highly structured and formalized, granting little product or production discretion to the partnering collaborator, to the highly informal and flexible, allowing the partnering collaborator a great deal of discretion. They can take many forms, such as contracts, public-private partnerships, or other agreements. The exact type of model for the collaborative governance arrangement is less important than how local governments choose to engage in the arrangement.

This section provides recommendations on the roles and capacity government should take on across the various stages of creating and executing collaborative governance.
governance arrangements. The observations in this section center on contracting since it was one of the most frequently used models in the cities we observed, but the analysis applies more broadly to collaborative governance models in general. Furthermore, the section on partner types that follows includes additional examples of collaborative governance, such as an attempted public-private partnership with a transportation network company (TNC).

Observations

In New Orleans, the Regional Transit Authority (RTA) outsources public transit, much of community engagement, and long-term strategic planning to its contractor, Transdev. For example, Transdev led a recent initiative to build a citywide Strategic Mobility Plan. While the RTA Board of Director’s is ultimately responsible for final plan approval, Transdev has ample discretion in leading the effort, organizing community engagement, and building the city’s 20-year transit goals.

We observed a range of governmental capacity in contract execution and oversight within the same city. For example, the RTA has a part-time volunteer board, one paid employee (the secretary), and a (currently vacant) Executive Director position. In addition, it contracts out Transdev’s performance evaluation to a different company. The RTA has had virtually no in-house capacity since well before Hurricane Katrina. Furthermore, board members are appointed by the mayors of Orleans and Jefferson parishes and do not necessarily have public transit (and even less likely, smart technology) expertise.

Meanwhile, New Orleans’ Emergency Medical Services (EMS) approached outsourcing and its lack of in-house smart technology expertise in a different way. Much like the RTA, EMS was reeling after Hurricane Katrina; but government officials made the decision not to outsource EMS and instead entrusted its rebuilding to agency leaders. They ultimately did outsource some technical pieces of the operations, such as billing, but maintained in-house leadership of the agency. Agency leadership also realized that EMS needed to maintain lean operations and did not have the funds to support a large technology procurement team. They therefore invested in the professional development of one of their paramedics who also had a strong IT background. This employee then played a pivotal role in developing and overseeing the technical parts of the agency’s contract due to his dual expertise. As a result, EMS has been able to maintain a lean yet effective operation.

Key Considerations

Consider the role of government vs. collaborator. When cities outsource, there is a spectrum of responsibilities they can retain in-house or leave to the collaborator. These include activities such as enrollment, community engagement, customer service, and strategic planning.

Invest in governmental capacity. Whether through a de facto process or intentional decision-making, city governments determine how many resources (i.e. employees and funding) will go towards the management and oversight of a specific collaborative governance arrangement. They must also determine where they want certain expertise housed and whether smart technology expertise is important for the execution and oversight of a particular arrangement.
Recommendations

1. Policymaking activities should be government-led:

Policymaking activities such as outreach and strategic planning should remain government-led, even when services are outsourced. Government should retain public responsibility for government-funded services. It is the basic role of the government to respond to the needs of the people it serves. Many collaborators, on the other hand, are private sector actors accountable to their shareholders and bottom line. In the implementation of smart technology, it is important for government to maintain its contact with citizens as it can be difficult for some residents to adapt to and rely upon new technologies. It is critical that government conduct strategic planning holistically to take advantage of synergies and reduce redundancies. For example, it makes little sense for a private entity that may not continue to have the contract to conduct a 20-year planning process.

2. Governments should leverage in-house expertise to oversee partnerships:

Tech expertise, subject matter expertise, and sufficient capacity are all critical for strong formation and oversight of collaborative governance arrangements. Often, contracting is seen as a feasible response to a lack of government capacity. While this can be true, cities can fail to appreciate that some in-house government capacity is still needed to adequately manage and oversee the contract. Without this capacity, outsourcing can result in services or products that are inadequate, expensive, or not aligned with the public interest. Furthermore, the government staff need to have the requisite subject matter and technological expertise, as NOLA EMS did.
While the last section analyzed considerations for governance models, this section looks at another dimension of collaboration: the type of partner. We discuss the private sector, advocacy groups, civic tech groups, and academia. It is important to note that while some of these partners are service-providers (e.g., TNCs) and thus can be involved in collaborative governance, others do not provide services (e.g., advocacy groups) but collaborate with government to improve services in other key ways, as discussed further below.
Private Sector

Observations

We observed instances where collaboration with private TNCs was attempted, but ultimately resulted in the two parties operating independently, not in partnership.

Tukwila is a Seattle suburb with a station along the Link light rail that connects SeaTac airport to the University of Washington. However, many residents do not live within walking distance of the Tukwila station. Uber decided to offer a discount of up to $3.50 per trip to riders whose origin or destination is the Tukwila light rail station. The company approached the city asking for help in increasing publicity. In return, the city asked for access to Uber’s ridership data in order to understand how the program was impacting Tukwila residents, who have incomes well below the region’s median. Uber declined, with concerns over sharing its proprietary data. Thus, the city has not actively promoted the discount.

A similar situation occurred between Sound Transit, the region’s major rail-based public transit provider, and Lyft when addressing the first mile/last mile problem in Seattle. Sound Transit and Lyft were building a potential public-private partnership to address parking issues and congestion, thereby improving commute times for individuals using public transit. Seattle had several stipulations in order to partner with Lyft to ensure equitable access for residents; as a result, the future is uncertain for this partnership until these requirements are met.

Key Considerations

Understand that pro bono services come at a cost. Pro bono services and resources may be received gratefully and may be very helpful. However, the non-governmental partner is likely not participating “out of charity,” but usually views such partnerships as a type of long-range investment. As in the TNC discounts example, a company may be generous now, but with the view that this experiment via pilot will one day capitalize into returns for the company—and potentially will come with a higher price tag in the future.
Recommendations

1. Consider financial and non-financial costs of working with private sector:

Conduct a cost-benefit analysis to understand the impacts of relying on the private sector to deliver services. Partnership with non-governmental entities should ultimately help the city’s people. Partnership for partnership’s sake often accomplishes no real benefit to the city or its residents.

2. Be cautious of pro bono services:

Develop a protocol to analyze future long-term costs to collaborating with the private sector. Partnership with non-governmental entities may seem as though no strings are attached, but look out for pitfalls. The partner is gaining from the relationship and may capitalize upon that in the future.

Advocacy Groups

Observations

Some advocacy groups linked transportation with other critical issues such as jobs or affordable housing to build a coalition. Ride NOLA, an advocacy and policy research organization based in New Orleans, publishes an annual “State of Transit” report that links transportation with other issues. For example, Ride NOLA found that the average New Orleans resident with a car can reach 86 percent of the region’s jobs in 30 minutes or less, but residents who take public transportation can only reach 11 percent of the region’s jobs in the same time. Ride NOLA’s analysis mobilized transit advocates to successfully campaign to get bus shelters installed throughout the city that could accommodate riders with longer commute times.

Advocacy groups also used data to strengthen their arguments and create dialogues. Ride NOLA successfully lobbied for a Riders Advisory Council, which is looking into an engaged platform for transit users to provide service feedback to the Regional Transit Authority. Most consistently across Miami, Seattle, Portland, and New Orleans, we observed that advocacy groups campaigned for simple, low-tech solutions focused on improved service and
communication. This highlights an important opportunity for transportation officials to build trust and buy-in among users, especially captive riders.

Key Considerations

Consider your target for change—choice or captive riders. Transportation policy makers constantly face whether to grow ridership among choice riders or improve service for captive riders. Our observations show that, in an attempt to cater to choice riders, policymakers often make decisions that do not accomplish what everyone wants from transit—reliable service. Reframing considerations of service quality versus ridership starts with viewing service quality as a way to increase ridership.

Be cognizant of who has the bullhorn and where the platform is. The loudest voices gather the attention of policymakers during community-oriented transit discussions. The loudest voices are also often individuals with more free time and greater financial power to generate noise and volume. Policymakers should consider who is at the table representing transit riders and create advocacy channels to engage a wider swath of residents.

Recommendations

1. Link transit with other salient topics:
The most successful advocacy groups we encountered linked transit with other critical areas to garner support from members as well as a wide range of stakeholders.

2. Look for low-tech solutions first:
One official in New Orleans emphasized the importance of providing better service to ensure that captive riders would not be lost. Low-tech solutions such as providing more reliable information and increasing real-time tracking can dramatically improve the transportation experience of residents on a daily basis. In addition, officials should strive to increase service reliability on existing routes.

3. Foster trust through iterative communication:
Better and more iterative channels of communications should be created as communication is central to smart tech implementation. Channels of communication need to be developed between advocacy groups and governments to foster trust. Facilitating dialogues and inviting organizations that are not singularly focused on transit can raise awareness of related issues. Also, ensure that communication is ongoing so that concerns can be dealt with as they arise.
Civic Hacker and Tech Community Observations

In some cities, we observed civic hackers dedicated to building a civic tech community, a crucial element in a city’s attempts to innovate. Portland and Seattle provided two strong but differently organized communities: Hack Oregon and Open Seattle.

Hack Oregon is a professional group focused on training individuals in data science and software development, including fee-based training. Projects are determined internally with a focus on providing job training and experience for entry-level software developers. Hack Oregon has developed projects such as AfterShock, a storytelling and data visualization platform to help Oregonians prepare for the next Cascadia earthquake. Hack Oregon aims to ensure the public has access to public civic data to improve awareness and quality of life.

Open Seattle spans various communities, including government, academia, and the private sector. Unlike Portland, it relies entirely on volunteers, with the University of Washington hosting data as a service, while Socrata, a mission-driven software company, provides space for monthly meetups where members pitch projects. The City of Seattle has a liaison who attends meetings, connecting Open Seattle and City Hall to increase feedback. Projects become apart of the public domain, ranging from what city services Seattle residents have access to and what the minimum wage should be based on employer.

Key Considerations

How to foster a civic tech community: Top-down vs. bottom-up approaches. There are trade-offs to consider between a top-down approach (e.g., Hack Oregon) and a bottom-up approach (e.g., Open Seattle). Each has a different impact on fostering a civic tech community. A professionalized workforce, such as Hack Oregon, could resolve specific technical challenges and one-time projects but sets an internal agenda without outside input. Open Seattle’s reliance on volunteers is more likely to develop a Smart City ecosystem that addresses questions of equity and allows for different stakeholders to influence the agenda and the prioritization of projects.
Recommendations

1. Utilize a collaborative community approach:
   Although a more professionalized community aimed at training and product delivery has certain appeals, it cuts itself off from a diversity of skills and people. By providing an open agenda-setting platform, communities can connect advocacy groups and their communities' needs with individuals and groups possessing the technical skills to address their specific challenges.

2. Provide direct connection to community:
   The City of Seattle has a liaison to Open Seattle, creating a direct connection to the needs of the community that uses open data. This allows insight into what the government should provide in terms of data products.

3. Actively connect advocacy groups with civic tech:
   Creating linkages between the two groups is an “easy win.” Connecting advocacy groups, which are often strapped for resources and technical expertise, with civic tech groups can help to provide technical solutions and foster a civic tech culture that is equity-driven.

Is there an open data environment already constructed? Cities often have to provide open data, by executive order or legislation, in order for civic hacking groups to be effective. Three of the four cities we visited, New Orleans, Miami, and Seattle, have mandates that require open data\(^2\). It is also important for the data to be published in a format that makes it accessible and easy for civic tech to utilize it.
Academia

Observations

Academic institutions can play a key role as trusted partners in order to host and analyze transportation data, harnessing their neutral position to encourage data sharing by private sector companies and public agencies. Such institutions can also use their expertise to combine transportation data from different sources and extract actionable insights for decision makers.

Portland State University (PSU), the largest public university in the Portland metropolitan area, provides a valuable regional resource in PORTAL, a website that aggregates regional transportation data. The Smart Cities team in Portland has relied on human capital from PSU, including recruiting team members with specific and pertinent technical skills that otherwise would be hard to find within government.

Additionally, the University of Washington (UW) created its Urbananalytics studio which unites UW’s initiatives in urban studies with its data science initiatives housed in its eScience Institute. The initiative provides Seattle and other cities with insights into the various urban challenges of the “modern city” using data science. The program funds students’ use of statistical and machine learning analysis to identify and alleviate social problems, particularly on issues of equity. One project leveraged researchers from UW’s transportation program to analyze Seattle’s ORCA smart card data on bus ridership and adjust the data for users who pay cash to board, who otherwise would not have been counted.

UW also now hosts the Transportation Data Collaborative (TDC), a data clearinghouse in which the University acts as a trusted third party host aggregating private and public regional data on transportation.

Key Considerations

Academic institutions are neutral hosts for data sharing and regional connectivity. Higher education institutions can provide a trusted third party when issues of cooperation, especially those surrounding data, arise. The value added from universities includes their research around local issues; their regional, national, and international academic networks and resources; and their expertise in manipulating and analyzing data.

Care should be invested, however, into designing proper governance mechanisms for ownership of the data and decision-making processes. Partnering with private sector actors and academic institutions does not absolve cities from responsibility for data; agencies should ensure they maintain a key stake in directing research and owning the eventual data repository.

Universities can serve as anchor institutions to mitigate innovation risk. Academic institutions can lead Smart Cities initiatives and pilot programs, removing risk from the public sector in case of failure. Their role and position allows them to support innovative projects that could advance regional smart transportation goals.
Recommendations

1. Use academic institutions to facilitate data sharing.
   Universities can act as a trusted third party to aggregate and host data from various sources, using their expertise to manage and govern the data securely and effectively, as seen with PSU’s PORTAL and UW’s TDC.

2. Collaborate with local institutions of higher learning:
   Local universities may have the in-house expertise necessary to advise on the appropriate use of technology. Higher learning institutions are also connected to vast networks that allow for regional and national knowledge sharing. Finally, they can provide a pipeline for needed human capital for technological transformation.

   City governments may also encourage local universities to connect with regional, national, and international organizations focused on Smart Cities in order to learn from outside innovations, pitfalls, case studies, and so on.
Conclusion

This report presents findings on Smart Cities implementation in the realm of transportation. The recommendations are based on extensive conversations with actors in the public and private sectors. Our research was focused on case studies in four diverse cities across the country, Miami, New Orleans, Portland, and Seattle, and spanned local, state, regional, and federal government actors.

Several broad themes emerged from our work. Cities must sustain political support at multiple levels for smart technology investments; center equity through all components and stages of the process; prioritize basic low-tech solutions that would boost upward mobility most; and work together with partners from the private sector, advocacy organizations, civic tech, and academia to find innovative solutions that can improve the lives of all residents. In our field
research, we found that cities are not as far along the Smart Cities pipeline as sometimes advertised. There are multiple challenges that cities must overcome in order to reach the full potential of the smart, interconnected, equitable city. To get there, we recommend a process that centers equity in every phase of implementation, defining upfront which populations need to be served and engaging communities throughout all stages of the design process.

In order to do this, we describe examples of ways to obtain executive and legislative buy-in and to build the sustained political support necessary for such initiatives. Building a Smart Cities team requires strategic use of funding, and the location of the team influences its potential impact. There are benefits and downsides surrounding contracting and partnerships with the private sector, and oversight and mission alignment must be considered carefully. Nonprofits, civic groups, and academic institutions can serve as important partners in finding smart solutions in areas such as public participation and data governance. Cities have the opportunity to use technological solutions to improve urban life, although these should not detract from efforts to improve the overall performance and reliability of public transit for all riders.

At the end of the day, this journey has real stories, real users, real people. The purpose of transportation is to ensure that the journeys people take every day on transportation can be completed seamlessly, providing access to jobs, healthcare, education, and community. American cities still have room to grow in achieving the vision of interconnected, responsive cities taking full advantage of smart solutions to improve operations. However, we are optimistic about the potential to use technology to move toward a more just, equitable, and mobile city—for all residents.
The Team

The research, writing, and design of this report was conducted by 10 second-year Master in Public Affairs students at the Woodrow Wilson School of Public and International Affairs at Princeton University. Members included: Samantha Adelberg; Sean Andrew Chen; Shehab Chowdhury; Michael Fletcher; Tomer Kremerman; Kristen Kruger; Madeleine Parker; Nick Patane; Aparna Ramesh; and Hope Wollensack. We were advised by our professor, Steven Strauss.

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Endnotes

7. WNYC, Average commute times in the U.S., 2006-2011, online at https://project.wnyc.org/commute-times-us/embed.html#9.00/29.9269/-89.9693.
14. Rosalind Brazel, City of Seattle Hires Kate Garman As First Smart Cities Coordinator, Seattle.gov Tech Talk Blog, July 20, 2017, online at http://techtalk.seattle.gov/2017/07/20/city-of-seattle-hires-kate-garman-as-first-smart-city-coordinator/. It should be noted, however, that Seattle's Smart Cities coordinator is a part of the city's IT department—association with a more central municipal unit would have likely produced even better results.
19. Additional funding sources include federal assistance, bonds, and surplus from previous programs. Sound Transit 3: The Regional Transit System Plan for Central


23. AVs present one potential exception that could require cities to invest substantial capital in the near future—to install road sensors and IoT components that would enable AVs to communicate with each other and with cities’ traffic data centers.

24. Economists term this dynamic “tournament theory”: the optimal prize value must be set such that the maximum number of participants invest the highest amount in bidding; if set too high, the costs of bidding will go up (since cities will be so interested in winning, they will invest more resources in preparing their bids—forcing others to do the same) and drive away some potential bidders, leading to suboptimal results. See Edward Lazear & Sherwin Rosen, Rank-Order Tournaments as Optimum Labor Contracts, The Journal of Political Economy 89:5, 841-846, October 1981.


29. TNCs, in particular, are reluctant to share granular data for fear of losing competitive advantage. Some cities, such as New York, passed regulations mandating that TNCs share pickup and dropoff data with the city government. See David Morris, New York City Says Uber Must Share Ride Data, Fortune, December 20, 2017, online at http://fortune.com/2017/02/05/uber-data-new-york-city/.

30. Washington State, in particular, has a strong Public Records Act which subjects almost all records held by government agencies to potential inspection requests from the public. Officials from cities in other states also mentioned that the involvement of academic institutions helped to facilitate data sharing by public actors and even across public agencies.